

High Temperature, Radiation Hard Electronics Architecture for a Chemical Sensor Suite for Venus Atmospheric Measurements, Phase II

II
Completed Technology Project (2017 - 2021)

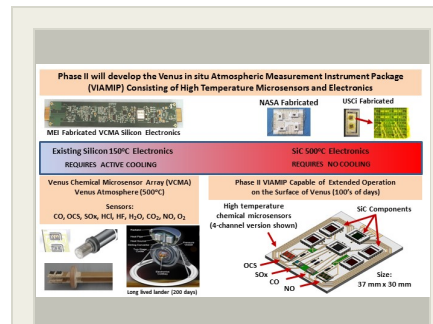


Project Introduction

Makel Engineering, Inc. (MEI) working with Ozark Integrated Circuits, Inc (OzIC) and United Silicon Carbide, Inc. (USCI) will develop a high temperature SiC electronics to support chemical microsensors for measuring the atmosphere of Venus at the surface for extended durations (100's of days). The chemical sensor array for measuring species at the surface of Venus has been developed by MEI. The Venus Microsensor Chemical Array can operate in a 500 C environment, but currently relies on silicon based electronics for signal acquisition, control, and data transmission. These electronics require cooling for a Venus mission. Our Phase I program defined approaches for the use SiC electronics to perform the control and signal transduction functions. A Venus In-situ Atmospheric Measurement Instrument Package (VIAMIP) was defined based on SiC ASICs. In Phase II, MEI and OzIC will develop ASIC designs compatible with the NASA's SiC process flow. In parallel, MEI and USCI will undertake design and fabrication of designs adapted for USCI's SiC process to establish a commercial source for SiC ASICs for the VIAMIP and to expanded the uses of high temperature microsensors.

Anticipated Benefits

The primary NASA application of the specific technology will be for instrument development for Venus exploration. Future missions in the atmosphere and surface of Venus as defined by the Venus Flagship Mission Science and Technology Definition Team will require high temperature electronics. The proposed development of high temperature electronics for a chemical measurement instrument supports the Decadal Survey finding that the Venus In-situ Explorer mission to be a New Frontiers high priority mission. The high temperature electronics also have direct applications to on-engine instruments, such as pressure transducers, chemical sensors, and actuators for jet engines. Non-NASA commercial applications are related to the use of instrumentation in high temperature applications such as mining, deep oil drilling, jet engine instrumentation and controls, solid oxide fuel cells, monitoring of geothermal wells, and deep underground mining. The use of high temperature, electronics which do not require active cooling can enable operation in environments which exceed the 250 C limit of commercial high temperature electronics.



High Temperature, Radiation Hard Electronics Architecture for a Chemical Sensor Suite for Venus Atmospheric Measurements, Phase II Briefing Chart Image

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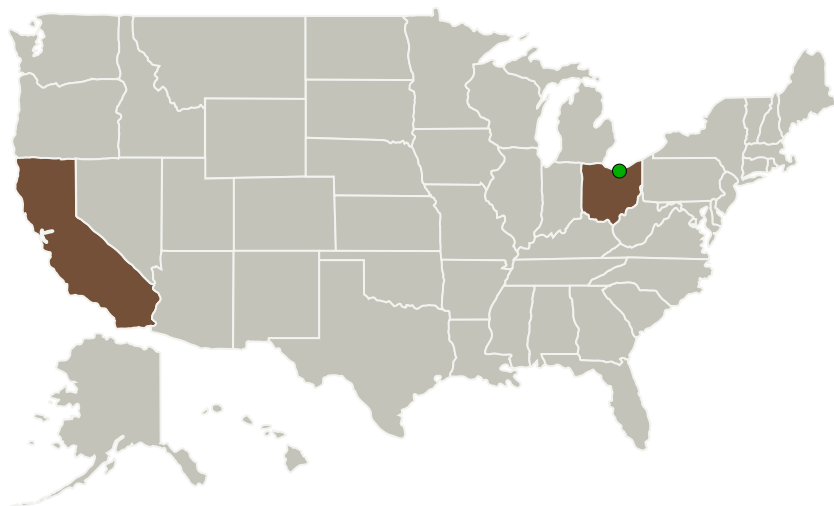
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Primary U.S. Work Locations and Key Partners




Organizations Performing Work	Role	Type	Location
Makel Engineering, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Chico, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

California	Ohio
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Project Transitions

 **April 2017:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Makel Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Managers:Jennifer C Xu
Matthew C Deans**Principal Investigator:**

Darby B Makel

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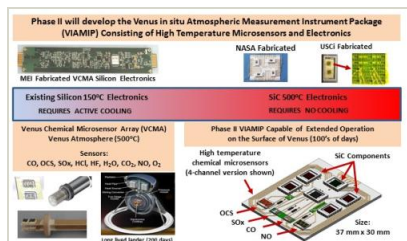


✓ **September 2021:** Closed out

Closeout Documentation:

- Final Summary Chart PDF(<https://techport.nasa.gov/file/141045>)

Images

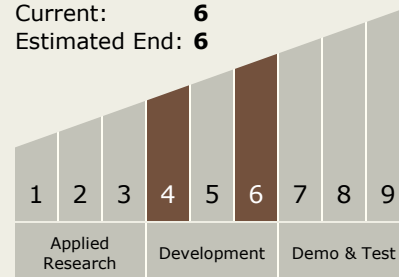


Briefing Chart Image

High Temperature, Radiation Hard Electronics Architecture for a Chemical Sensor Suite for Venus Atmospheric Measurements, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/131722>)

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System